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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,692	03/30/2001	Ting Chien	015290-506	5245

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08/30/2004

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EXAMINER

CHEN, KIN CHAN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 08/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/820,692

Applicant(s)

CHIEN ET AL.

Examiner

Kin-Chan Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 July 2004.
- 2a) ☐ This action is **FINAL**.      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-12 and 14-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,6-12 and 14-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1,4,7,9-11,15-17,20,22-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Liu et al. (US 6,451,703).

In a method of oxide etching, Liu teaches a method of etching a dielectric layer with selectivity to an underlying stop layer. A semiconductor substrate is supported in a plasma etch reactor wherein the etch reactor is capacitively coupled plasma reactor including a showerhead electrode. The substrate includes a dielectric layer (e.g., oxide layer) over a nitride stop layer. An etchant gas may be supplied to the plasma etch chamber with the showerhead. Etching openings may be performed in the dielectric layer by energizing the etchant gas into a plasma state. The etchant gas may comprise a hydrogen-free fluorocarbon gas represented by  $C_xF_y$  gas wherein  $y/x \leq 1.5$ . See col. 1, lines 38 through col. 2, line 15; col. 4, lines 5-65 and col. 5 lines 4-8. Tables 1 and 4.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2, 3, 8, 12, 14, 18, 19, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US 6,451,703).

In a method of oxide etching, Liu teaches a method of etching a dielectric layer with selectivity to an underlying stop layer. A semiconductor substrate is supported in a plasma etch reactor wherein the etch reactor is capacitively coupled plasma reactor including a showerhead electrode. The substrate includes a dielectric layer (e.g., oxide layer) over a nitride stop layer. An etchant gas may be supplied to the plasma etch chamber with the showerhead. Etching openings may be performed in the dielectric layer by energizing the etchant gas into a plasma state. The etchant gas may comprise a hydrogen-free fluorocarbon gas represented by  $C_xF_y$  gas wherein  $y/x \leq 1.5$ . See col. 1, lines 38 through col. 2, line 15; col. 4, lines 5-65 and col. 5 lines 4-8. Tables 1 and 4.

Dependent claims 3, 19 and 21 differ from Liu by specifying various etching selectivities. However, the skilled artisan recognizes that in plasma etching, changing the flow rates of etchants and the power change the plasma densities and fluxes, and ion energy, and change the etching properties and etching selectivity. Hence, it would

have been obvious to one with ordinary skill in the art to vary the flow rates of etchants and process parameters in order to produce desired etch rate selectivity.

The above cited claims differ from Liu by specifying various compositions (e.g., flow rates of etchants ( such as claims 8 and 14) processing parameters (such as pressure and temperature in claim 12; RF energy in claim 2). However, they are recognized result-effective variables, and commonly determined by routine experiment. The process of conducting routine experimentations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality, it is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to modify Liu by performing routine experiments (by using various compositions and different processing parameters) to obtain optimal result in order to produce the best etched product achievable. See Demmin (US 6,635,185) ,Tahara (US 5,356,515) and Loewenstein (US 5,741,396) in the record as evidences.

As to dependent claim 18, in order to complete the etching of the openings, keeping an amount of etchants sufficient to avoid etch stop is expected in the method of Liu.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu as applied to claim 1 above, and further in view of Schmitt (US 6,228,438).

Claim 6 differs from Liu by specifying dual frequency capacitively coupled plasma reactor including an upper showerhead electrode and a bottom electrode. Schmitt is relied on only to teach one of the popular commercial available plasma reactors with

dual frequency capacitively coupled plasma reactor including an upper showerhead electrode and a bottom electrode as claimed (see col. 1, line 15-17; col. 8, lines 1-12). Hence, it would have been obvious to one with ordinary skill in the art to use the popular commercial available plasma reactors as disclosed by Schmitt in the process of Liu in order to provide their art recognized advantages and produce an expected result.

### ***Response to Arguments***

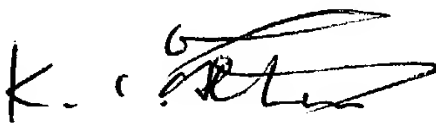
5. Applicant's arguments with respect to claims 1-4, 6-12, 14-27 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Demmin (US 6,635,185; Col. 7, lines 5-25) discloses that one skilled in the art of plasma etching may vary composition, flow rate, temperature, pressure, power, time, and bias voltage accordingly to etch a desired material satisfactorily. Tahara (US 5,356,515) discloses that etch rate and selectivity as a function of flow rate (Fig. 8, 10). Loewenstein (US 5,741,396) discloses that selectivity as function of (composition) ratio of etchants, also teaches to vary pressure, temperature, gas flow, power, frequency, see col.8, lines 3-12 and Figures.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*August 27, 2004*

  
Kin-Chan Chen  
Primary Examiner  
Art Unit 1765